REMARKS

In the Office Action, the Examiner rejected claims 1-6 under 35 USC § 102(b); and rejected claims 7-16, 18, 19, 22-34 and 36 under 35 USC § 102(b); and rejected claims 7, 13, 17, 21 and 35 under 35 USC § 103(a). These rejections are fully traversed below. In addition, the Examiner allowed claims 37-39. Still further, the Office Action Summary indicated that claims 20 and 21 were objected to, but it is not clear what the objection is.

Claims 7, 22, 23 and 27 have been amended to further clarify the subject matter regarded as the invention. In addition, claims 8, 24 and 25 have been cancelled from the application without prejudice or disclaimer. Claims 1-7, 9-23 and 26-39 remain pending in the application.

Claims 1-7, 9-23 and 26-39 remain pending in the application. Reconsideration of the application is respectfully requested based on the following remarks.

PATENTABILITY OF CLAIMS 1-37

In the Office Action, the Examiner rejected claims 1-6 under 35 USC § 102(b) as being anticipated by Matouk et al., US Patent No. 5,625,684; rejected claims 7-16, 18, 19, 22-34 and 36 under 35 USC § 102(b) as being anticipated by Christensen et al., US Patent No. 4,131,760; and rejected claims 7-13, 17, 21 and 35 under 35 USC § 103(a) as being unpatentable over Matouk et al. These rejections are fully traversed below.

The present invention pertains to improved approaches to adaptively suppress interfering noise in a multi-microphone directional system. These approaches operate to adjust a directional null for the multi-microphone directional system so that a dominant noise source is suppressed.

Claim 1 pertains to an adaptive directional sound processing system that includes at least two microphones, a delay circuit having an adaptive delay amount, a subtraction circuit, and a delay amount determination circuit. According to claim 1, the adaptive delay amount imposed by the delay circuit is controlled by a delay control signal that is produced by the delay amount determination circuit.

In contrast, Matouk et al. pertains to an active noise suppression system for a telephone headset. The system in Matouk et al. uses a pair of microphones (sound sensors). A first microphone 36 is for picking up human sounds. The second

microphone 41 is for picking up external environmental noise. The adaptive filter 56 supplies an electrical signal to a summer 52 so that the environmental noise picked up by the microphone 36 can be suppressed. "If the environmental noise has not been suppressed to a desired level, the error in the suppression is picked up and supplied by the feedback loop 57 to the filter 56 so that an appropriate correction can be made by the adaptive filter 56 to supply a corrected third electrical signal to the summer 52." Matouk et al., col. 3, lines 43-48. Hence, Matouk et al. does not pertain to directional sound processing. That is, the summer 52 is not producing an output difference signal, such as recited as being produced by the subtraction circuit recited in claim 1. Instead, the summer 52 in Matouk et al. is attempting to cancel environmental noise from desired sound pickup from another microphone. Still further, the adaptive filter 56 in Matouk et al. is adapting to suppress the environmental noise. However, such adaptation is very different from, and thus fails to teach or suggest, a delay amount determination circuit that controls a delay amount that is imposed by a delay circuit as recited in claim 1. Accordingly, it is submitted that Matouk et al. fails to teach or suggest the features recited in claim 1. In addition, it is submitted that dependent claims 2-6 are also patentably distinct from Matouk et al. for at least the same reasons as claim 1. Accordingly, it is respectfully requested that the Examiner withdraw the rejection of claims 1-6 under 35 USC § 102(b) as being anticipated by Matouk et al.

Claim 7 also pertains to an adaptive directional sound processing system. Claim 7, like claim 1, recites a delay circuit that utilizes an adaptive delay amount, and a delay amount determination circuit that produces a delay control signal that is used to control the adaptive delay amount. However, claim 7 recites a logic circuit in place of the subtraction circuit recited in claim 1. Nevertheless, for reasons similar to those noted above with respect to claim 1, it is submitted that claim 7 is patentably distinct from Matouk et al. In addition, it is submitted that dependent claims 9-21 which include the limitations of claim 7 through dependency are also patentably distinct from Matouk et al. for at least the same reasons as claim 7.

On page 5 of the Office Action, the Examiner also appears to reject claim 35 under 35 USC § 103 as being unpatentable over Matouk et al. However, since claim 35 depends from independent claim 27, which recites adapting an adaptive delay amount for directional noise suppression, it is submitted that claim 27, and thus claim 35, are also patentably distinct from Matouk et al. for at least this reason.

Christensen et al. describes a multiple microphone dereverberation system. When using two or more spatially separated microphones, multi-path reverberative interference results. According to one aspect described in Christensen et al., first and second audio signals are provided by spatially separated transducers. "[T]he first audio signal is delayed by a fixed time period and the second audio signal for a time period corresponding to the time difference between said first and second pulses. In this way, the relative delay of said first and second audio signals is altered to align said delayed first and second signals. The aligned first and second signals are summed to produce an output signal with reduced reverberative interference." Christensen et al. col. 2, lines 42-50.

In contrast, claim 7 pertains to an adaptive directional sound processing system. Among other things, the adaptive directional sound processing system of claim 7 includes a delay circuit that delays the electronic sound signal from at least one of two or more microphones by an adaptive delay amount, and a delay amount determination circuit that produces a delay control signal based on the output signal produced by a logic circuit. The delay control signal is supplied to the delay circuit so as to control the adaptive delay amount. Still further, claim 7 recites that "the adaptive delay amount varies so as to directionally suppress undesired sound." Although a delay 114 is controllable in Christensen et al., the control of the delay 114 is not altered for the purpose of directionally suppressing undesired sound. Instead, the delay 114 is altered to phase align delayed first and second signals provided by spatially separated transducers (microphones). Additionally, the multiple microphone dereverbation system of Christensen et al. is not a directional sound processing system. That is, the transducers 101 and 110 have their electronic signals added together once any phase difference between them has been reduced by altering of the delay 114. "In this way, the feedback arrangement including logic circuit 121 is operative to phase-align the audio signals applied to summing circuit 107 whereby the echo and reverberative effects are significantly reduced." Christensen et al., col. 6, lines 60-63. Accordingly, it is submitted that claim 7 is patentably distinct from Christensen et al.

Claim 22 also pertains to an adaptive directional sound processing system. The adaptive directional sound processing system 22 is generally similar to claim 7, though the logic circuit and the delay amount determination circuit of claim 7 are replaced by logic means and delay determination means, respectively, in claim 22. Nevertheless,

for at least the reasons noted above with respect to claim 7, it is submitted that claim 22 is also patentably distinct from Christensen et al.

Claims 23 and 27 are method claims that operate to provide directional noise suppression. For reasons similar to those noted above, it is submitted that claims 23 and 27 are also patentably distinct from Christensen et al.

In addition, it is submitted that dependent claims 9-21, 26 and 28-36 are also patentably distinct for at least the same reasons as their corresponding independent claim.

Based on the foregoing, it is submitted that claims 1-7, 9-23 and 26-36 are patentably distinct from Matouk et al. or Christensen et al. Although the above discussion concentrates on the features of independent claims, it should be noted that the additional limitations recited in the independent claims or the dependent claims are not further discussed as the above-discussed limitations are clearly sufficient to distinguish the claimed invention from Matouk et al. or Christensen et al. Thus, it is respectfully requested that the Examiner withdraw the rejections under 35 USC §§ 102(b), 103(a).

INFORMATION DISCLOSURE STATEMENT

With respect to the Information Disclosure Statement filed October 15, 2002 (mailed October 9, 2002), Applicant thanks the Examiner for returning the PTO-1449 associated with the Information Disclosure Statement, thereby indicating consideration of the references indicated thereon. However, Applicant notes that the Examiner crossed out four U.S. Patent documents from such submission without explanation. Accordingly, submitted together herewith is a Supplemental Information Disclosure Statement resubmitting each of the four U.S. Patent documents that the Examiner has crossed-out so that the Examiner is able to indicate consideration of these references.

SUMMARY

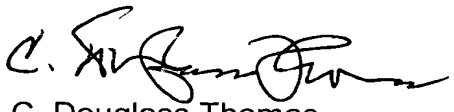
It is submitted that the rejection of 1-7, 9-23 and 26-36 should be withdrawn. Reconsideration of the application and an early Notice of Allowance are earnestly solicited.

If there are any issues remaining which the Examiner believes could be resolved through either a Supplemental Response or an Examiner's Amendment, the Examiner

is respectfully requested to contact the undersigned attorney at the telephone number listed below.

Applicant hereby petitions for an extension of time which may be required to maintain the pendency of this case, and any required fee for such extension or any further fee required in connection with the filing of this Amendment is to be charged to Deposit Account No. 50-0388 (Order No. AUD1P004C1).

Respectfully submitted,
BEYER WEAVER & THOMAS, LLP



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